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THE RELATION OF THE DEPRESSOR NERVE TO THE VASOMOTOR CENTRE.

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[From the Laboratory of Physiology in the Harvard Medical School.]

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CONTENTS.

Introduction.

IT is known that the nerve cells in the bulbar vasomotor centre send their axis-cylinder processes to many subsidiary cells, through which the bulbar discharges may reach the most distant peripheral structures. It is known, too, that all parts of the body are connected with the vasomotor centre by afferent nerves. Into this centre flow countless impulses, a never-interrupted stream. Yet the problem of the relation of the afferent fibres to the individual cells of the centre has not been formulated with much precision, nor have satisfactory quantitative methods been employed for inquiring into this relation.

The older conception of the nerve centre as a narrowly circumscribed compact group of nerve cells tended to sink the individuality of the cell. The more modern conception of a number of cells associated in function rather than grouped closely in space leads directly to the consideration of the cells as individuals. This individual conception suggests the thought that the same principle of division of labor which set aside the bulbar vasomotor cells for the control of the diameter of all the blood-vessels in the body may further have given the control of particular regions into the special keeping of certain of these cells. It is true that the space occupied by the bulbar vasomotor centre is not very great, when measured macroscopically, but relatively it is great enough to harbor an im-

[1] A summary of these experiments was printed in the Proceedings of the American Physiological Society, This journal, 1900, iii, p. xxiv.

mense number of nerve cells without a degree of crowding that would throw doubt on the mechanical possibility of groups functionally separate.

The importance of this problem will be obvious when the reader reflects that if the afferent vasomotor fibres influence all the bulbar cells alike, the bulbar centre can have no part in the distribution of the blood to the several regions and organs of the body, but can act merely to lower or raise the general blood pressure. The local distribution of the blood would then be the function of the spinal or sympathetic vasomotor neurons, or perhaps to some extent of the blood-vessels themselves.

The most conspicuous afferent path to the vasomotor centre is furnished by the depressor nerve, and the central relations of this nerve are naturally to be investigated first. An additional reason for choosing the depressor nerve is found in certain experiments made by Cyon and Ludwig[1] which bear upon the problem, though they do not solve it; nor do they indicate, indeed, that the problem stated here was clearly recognized.

The experiments of Cyon and Ludwig are described in that beautiful example of the genius of investigation in which the discovery of the depressor nerve is recorded. It will be remembered that Cyon and Ludwig, after demonstrating that the excitation of the central end of the depressor nerve caused a great fall in the general blood-pressure, excluded a change in the heart beat as the cause of the fall in pressure and thus reached the conclusion that the cause lay in a reduction of the peripheral resistance. Knowing the large part which the abdominal vessels play in the peripheral resistance, they suspected that the depressor produced its effect especially by their dilatation. This explanation they put to experimental proof in two ways. First, the depressor nerves were stimulated after the section of both splanchnic nerves; the blood-pressure was observed to fall only 2.5 mm. of mercury (from 31.5 to 29 mm.) Secondly, the splanchnic area was excluded by the compression of the aorta just below the diaphragm, and the depressor then stimulated. In one of the experiments of this latter sort, the blood-pressure, which had risen on compression of the aorta from 47 to 105 mm. of mercury,

[1] Cyon, E., and Ludwig, C.: Arbeiten aus der physiologischen Anstalt zu Leipzig vom Jahre 1866, pp. 128–149. Also: Berichte der mathematisch-physikalischen Classe der königlichen Sächsischen Gesellschaft zu Leipzig, 1866, xviii, pp. 307–328.

was not lowered by depressor stimulation; in the other, it rose on compression from 42 to 143 mm., and, on excitation of the depressor, fell to 134 mm. Both these procedures seemed to Cyon and Ludwig to demonstrate that the depressors act almost entirely through the splanchnic nerves upon the abdominal vessels. With this statement they leave the question.

The methods here employed by these distinguished investigators are not beyond criticism. In the first experiment the simple stimulation of the depressor before and after the section of both splanchnic nerves is used to measure quantitatively the difference between the effect of the depressor on the abdominal vessels and its effect on all the other blood-vessels. But the two measurements compared are not made from the same level. The section of the splanchnic nerves reduced the blood-pressure usually from 30 to 50 per cent. The blood-vessels, except in the abdomen, were thus comparatively empty when the depressor was stimulated. Consequently their dilatation, on stimulation of the depressor, could not produce so great an effect as if they had been normally full. The second experiment is still less satisfactory. The compression of the aorta immediately beneath the diaphragm excludes from depressor action not only the abdominal vessels but those of the lower part of the trunk and the hind limbs — more than half the body. The regions still accessible to the depressor are the head, neck, thorax, and fore-limbs. But the cranial and thoracic viscera are so poorly supplied with vasomotor nerves that they are frequently declared to have none, and it is known that the dilatation of the vessels of the head and neck does not very materially affect the general blood-pressure. Evidently the experiment cannot properly be used to compare the action of the depressor on the splanchnic area with its action on all the remaining vascular areas. In short, Cyon and Ludwig do not prove that the fall in blood-pressure on depressor stimulation is due chiefly to the dilatation of the abdominal vessels. They prove merely that by section of the splanchnic nerves the blood-pressure is lowered almost as much as by stimulation of the depressor.

Bayliss[1] secured plethysmographic tracings showing vascular dilatation in the limbs and in the tongue and ear. He does not attempt to estimate the relative dilatation of the abdominal and extra-abdominal vessels.

[1] Bayliss, W. M.: Journal of physiology, 1893, xiv, pp. 303–325.

The Method.

The method devised for the present investigation consists of (1) the determination of the fall in general blood-pressure produced by the stimulation of the depressor nerves in animals in which the splanchnic nerves are prepared for experimentation but are still connected with the vasomotor centre; (2) the removal of the splanchnic area from the control of the vasomotor centre by the section of the splanchnic nerves; (3) the restoration of the general blood-pressure to the normal level, after the fall which the section of the splanchnics causes, by the stimulation of the peripheral ends of the splanchnic nerves or by the injection of normal salt solution into the jugular vein; (4) the stimulation of the depressors while the blood-pressure is maintained near the normal height and the splanchnic area is excluded by the previous section of its nerves. The comparison of the fall obtained by the second stimulation (the blood-pressure being normal and the splanchnic area excluded), with that obtained while the splanchnic nerves were still unsevered, will determine the relative parts taken by the splanchnic area and the remaining vascular areas in the depressor effect. If it be found that depressor stimulation lowers the blood-pressure as much after splanchnic section as before it, the depressor certainly does not produce its effect by means of special connections with the splanchnic area through the bulbar cells; and if a special connection does not exist in the case of the splanchnic area, it is probable that there is no such special connection with any vascular area, or, in other words, that the depressor nerves act on all the bulbar vasomotor cells alike.

The animals used were rabbits. They were anæsthetized with a mixture of three parts ether and one part 96 per cent alcohol. Two series of experiments were performed: in the first, the blood-pressure was restored to normal after the section of the splanchnics by the stimulation of the peripheral ends of these nerves; in the second, the blood-pressure was restored to normal after the section of the splanchnics by the injection of normal salt solution into the jugular vein.

In the first series of experiments, the anæsthetized rabbits were tracheotomized, and both depressor nerves were isolated, ligated with silk, and severed on the cardiac side of the ligature. A cannula was tied in the left carotid artery. The abdomen was opened in the

linea alba from the ensiform cartilage nearly two-thirds of the distance to the symphysis. Two hooks on each side were passed through the edges of the wound and drawn up by threads passed over bars placed alongside the animal and ten to fifteen centimetres above it. The abdominal walls formed thus a deep oblong cavity, at the bottom of which lay the intestines. The rabbit board was inclined to the right, in order that the left splanchnic nerve might be more easily reached near the suprarenal body. The nerve was grasped with very small "bull-dog" forceps and shielded electrodes passed around it distal to the forceps. The nerve was then severed on the proximal side of the forceps, which prevented the stump from slipping through the hard rubber shield of the electrodes. As soon as the splanchnic nerve was severed, the foot of the rabbit board was raised about five centimetres higher than the head, to prevent anæmia of the brain from the filling of the relaxed abdominal vessels. The rabbit board was now tilted towards the left, artificial respiration was begun, and the central tendon of the diaphragm was incised so that the right splanchnic nerve could be reached. This was secured and severed in the same manner as the left nerve. During these several procedures the intestines were kept covered with pads of absorbent cotton wet with warm 0.8 per cent sodium chloride solution; they were never touched by the fingers directly, but were pressed gently out of the way with the cotton pads wet in normal salt solution. After the preparation of the splanchnic nerves, the wound was closed with a few stitches and the abdomen covered with a thick layer of dry cotton.

The carotid cannula was connected with a Hürthle membrane manometer and the rabbit board placed on a box high enough to bring the artery level with the chamber of the manometer. The membrane manometer was graduated by means of a mercury column in the usual way; the graduation scale is reproduced in Fig. 4, page 295; the writing point returned from 100 mm. mercury pressure accurately to the zero abscissa when the chamber of the manometer was placed in communication with the atmospheric air. A separate Du Bois-Reymond inductorium was used to stimulate each of the splanchnic and each of the depressor nerves. The inductoriums were arranged in two pairs. In each pair the primary coils were connected through a double key (Pohl's commutator, without cross-wires), with two Daniell cells in such a way that on turning the cradle the current from one cell passed through one inductorium

and the current from the other cell passed simultaneously through the other inductorium. The secondary coils were connected with the splanchnic nerves by means of the shielded electrodes and with the depressor nerves by ordinary electrodes. In the primary circuit of one of the depressor coils, an electromagnetic signal was introduced to mark the duration of depressor stimulation. The beginning and the end of splanchnic stimulation were marked on the drum by hand. Three persons took part in each experiment; one managed the stimulating currents and the graphic record, while each of the others held an electrode against the central segment of a depressor nerve raised in the air by means of a silk thread. When all was ready, the kymograph drum was allowed to revolve and after a few moments during which the low blood-pressure following splanchnic section was recorded the peripheral ends of the divided splanchnic nerves were stimulated continuously. The blood-pressure was raised by this splanchnic excitation to almost the normal level, and during its maintenance at this level the central ends of both depressor nerves were stimulated for a period sufficient to bring out the full depressor effect. Then the stimulation of the depressors was stopped while the splanchnic stimulation went on. The complete division of the splanchnic nerves was verified in each case by post-mortem examination.

The manipulation of the intestine necessary in preparing both splanchnic nerves for stimulation is much greater and more prolonged than where the nerves are simply severed. The shock of the former operation and the inevitable loss of tone in the vasomotor system make it difficult to secure maximum vasomotor effects. A second series of experiments was accordingly made. In these, the splanchnic nerves were severed with the least possible disturbance of the viscera and the blood-pressure was restored to normal by the injection of warm normal salt solution into the jugular vein. The depressor nerves were then stimulated as before.

The Effect of Depressor Stimulation in Animals in which the Splanchnic Nerves are Prepared but are not Severed.

In considering the results gained with this method it is obvious that the effect on blood-pressure of depressor stimulation with unsevered splanchnic nerves must first be examined, for the present

inquiry consists essentially in comparing the depressor action before and after the separation of the splanchnic area from the vasomotor centres. Obviously, too, the fall in blood-pressure obtained with animals uninjured except by the relatively slight operation of section of the depressors and the placing of a cannula in an artery will not serve for this comparison. Allowance must be made for the disturbance of the vasomotor system consequent upon the manipulation of the intestine in preparing the splanchnic nerves for experimentation. It is necessary to determine the effect of depressor stimulation in animals in which the splanchnic nerves have been prepared but have not been severed. The following extract from the protocol of October 3, 1899, is evidence of the serious impairment of vasomotor function which may follow the manipulation of the intestine.

Experiment Oct. 3, 1899. — The depressor nerves were prepared in a rabbit anæsthetized with ether and alcohol. The carotid blood-pressure was recorded by means of a mercury manometer. The central ends of both depressor nerves were stimulated simultaneously. The blood-pressure fell from 106 to 76 mm. Hg (28 per cent). On repeating the stimulation, the pressure fell from 112 to 76 mm. (32 per cent). Threads were now placed about the splanchnic nerves, but the nerves were not severed. This manipulation caused the blood-pressure to fall to 64 mm. On stimulation of both depressors, there was a further fall to 50 mm. (22 per cent).

Observations accordingly were made to determine the degree to which the depressor nerves can lower blood-pressure in animals in which the abdominal viscera have been disturbed by the preparation of the splanchnic nerves. It should be stated that these experiments were done after long practice in the preparation of the splanchnic nerves, and that every precaution against rough handling was taken. The results are presented in Table I (p. 297).

In the experiment of October 14, which is one of those included in Table I, the blood-pressure, which had fallen to about 60 mm. in consequence of the preparation of the splanchnic nerves, rose suddenly without any apparent cause to about 120 mm. The depressors were at once stimulated and the pressure fell to about 55 mm. (Fig. 1). On repeating the stimulation the blood-pressure fell from 120 mm. to 60 mm. (50 per cent), but after the stimulation the pressure returned only to 105 mm., and soon after fell rapidly in such a way as to make a continuation of the experiment imprudent. It seems best

to mention this experiment particularly, although the exceptional character of the observation unfits it for use as a basis of comparison. So large a fall in blood-pressure, after the preparation of the splanchnic nerves, was not observed again, either before or after their separation from the vasomotor centre.

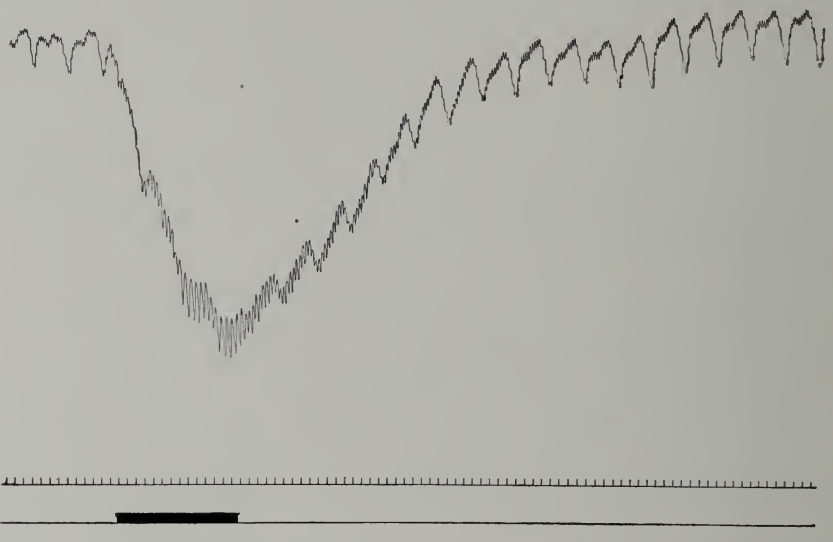

FIGURE 1. — October 14, 1899. A curve of blood-pressure in the carotid artery recorded by a mercury manometer. The middle line marks the time in seconds. The lowest line marks the atmospheric pressure; it was drawn by the writing point of an electro-magnetic signal in the primary circuit of one of the stimulating inductoriums. The broad black band records the simultaneous stimulation of both depressor nerves. The blood-pressure fell from about 120 mm. to about 55 mm. (54 per cent).

It appears from Table I that in animals in which a thread has been placed around both splanchnic nerves the stimulation of the depressor nerves causes a fall in blood-pressure usually of from 35 to 40 per cent. With this must be compared the effect of depressor stimulation when the splanchnic nerves are separated from the vasomotor centre and the blood-pressure maintained near the normal level.

The Effect of Depressor Stimulation after the Separation of the Splanchnic Area from the Vasomotor Centre.

It has already been stated that the blood-pressure was raised after section of the splanchnic nerves by the stimulation of their peripheral ends, or by the injection of normal salt solution into the jugular vein. The experiments in which the pressure was raised by stimulation will be presented first. These experiments are illustrated by Fig. 2, from an experiment performed April 7, 1899.

In this figure arrows mark respectively the beginning and the end of stimulation of both splanchnic nerves. The upper curve records the blood-pressure in the carotid artery, registered by a Hürthle membrane manometer. The lower curve was drawn by an electromagnetic signal, the writing point of which lay in the line of atmospheric pressure; the heavy black line marks the vibration of the signal throughout the simultaneous stimulation of both depressor nerves. On stimulation of the splanchnic nerves the blood-pressure rose from 45 to 58 mm. of mercury; by depressor stimulation it was lowered to 35 mm.; a few moments after depressor stimulation it rose to 54 mm.; on ceasing the stimulation of the splanchnics the blood-pressure sank gradually to its former level of 45 mm. Thus depressor stimulation, after the splanchnic nerves were separated from the vasomotor centres, caused a fall of forty per cent in the general blood-pressure.

The results of this series of experiments are shown in Table II (p. 298).

The table shows that the stimulation of the depressor nerves after the separation of the

Figure 2. — April 7, 1899. Four-sevenths the original size. The upper line is the curve of blood-pressure from the carotid artery of the rabbit registered by a Hürthle membrane manometer. The lower line is the atmospheric pressure. The writing point of the manometer rose 1 mm. for each increase of 4 mm. mercury in blood-pressure. The first arrow marks the beginning and the second arrow the end of the stimulation of both splanchnic nerves. The heavy black line was drawn by an electromagnetic signal which vibrated during the simultaneous stimulation of both depressor nerves. In consequence of the depressor stimulation the blood-pressure fell 40 per cent.

splanchnic area from the vasomotor centre lowers the blood-pressure from 30 to 40 per cent.

The placing of shielded electrodes about the splanchnic nerves is a much more difficult operation than the simple section of the nerves, and the disturbance of the vasomotor function is correspondingly great. It was decided, therefore, to make a second series of experiments, in which the pressure should be raised by injecting into the jugular vein warm 0.8 per cent sodium chloride solution. The results are shown in Table III (p. 299). These measurements entirely confirm those presented in Table II.

The protocol and one curve from the experiments of October 21 and October 26 will sufficiently illustrate the work summarized in the tables.

Experiment Oct. 21, 1899. — In a rabbit anæsthetized with a mixture of ether and alcohol both depressor and both splanchnic nerves were prepared in the manner already described (page 287). A thread was passed around each splanchnic nerve. Great pains were taken not to injure the intestines. The blood-pressure was recorded by a Hürthle membrane manometer connected with a cannula in the carotid artery. A cannula was also placed in the right jugular vein. The central ends of both depressors, raised in the air on silk threads, were stimulated simultaneously. The blood-pressure fell from 80 to 60 mm. mercury (25 per cent). On repeating the stimulation (with somewhat too brief an interval) the pressure fell from 75 to 60 mm. (20 per cent). The splanchnic nerves were now torn through by means of the threads which had been passed around them. The blood-pressure thereupon fell to 60 mm. Through the cannula in the right jugular vein 0.8 per cent sodium chloride solution at 38°C. temperature was injected until the blood-pressure rose to 85 mm. The depressors were then stimulated again, with the following result: —

Blood-pressure before stimulation of depressor nerves.	Lowered by stimulation to	Fall per cent.
85 mm.	65 mm.	24
85	58	32
88	60	32
85	58	32

The artificial respiration, which had been begun during the preparation of the right splanchnic nerve, was now discontinued during the brief period required for renewed stimulation. The rabbit did not become dyspnœic. The oscillations of the blood-pressure of course disappeared, thus making the

reading of the blood-pressure easier. The stimulation of both depressors now gave : —

Blood-pressure before depressor stimulation.	Lowered by stimulation to	Fall per cent.
86 mm.	60 mm.	30
85	60	29
90	60	33
88	55	37
90	57	37

(The last of these measurements is shown in Fig. 3.)

Fearing that the fall in blood-pressure in the last two stimulation periods might be thought to be due in part to the escape of the stimulating current to the vagus, both vagi were severed between the chest and the point at which the depressors were stimulated. As in all experiments, the central ends of the severed nerves were held on a black silk thread well into the air. On renewing the stimulation the blood-pressure fell from 90 to 60 mm. (33 per cent). The post mortem examination showed that the splanchnic nerves had both been severed.

One of the records made in this experiment is reproduced in Fig. 3.

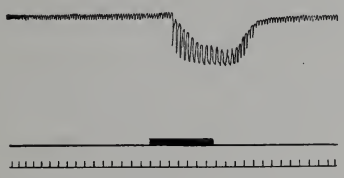

FIGURE 3. — October 21, 1899. Original size. The uppermost line is the curve of blood-pressure in the carotid artery registered by a Hürthle membrane manometer. The middle line is atmospheric pressure; this line was drawn by the writing point of an electro-magnetic signal, which recorded with a broad black line the duration of depressor stimulation. The lowest line marks the time in seconds. Both splanchnic nerves were severed. The blood-pressure was raised after this section by the injection of 0.8 per cent NaCl solution into the jugular vein. On simultaneous stimulation of both depressor nerves the blood-pressure fell from 90 mm. to 57 mm. (37 per cent).

In this figure, the uppermost line was drawn by a Hürthle membrane manometer connected with the carotid artery. The middle line records the atmospheric pressure. It was drawn by the writing point of an electro-magnetic signal placed in the primary circuit of one of the inductoriums used to stimulate the depressor nerves. The heavy black band upon this line marks, therefore, the simultaneous excitation of both depressor nerves. The lowest line marks

the time in seconds. Both splanchnic nerves had been severed. The blood-pressure had been raised after splanchnic section to 90 mm., by the injection of warm 0.8 per cent sodium chloride solution into the right jugular vein. On stimulating both depressor nerves, the blood-pressure fell to 57 mm. (37 per cent).

The experiment of October 26 is equally instructive.

Experiment Oct. 26, 1899. — In a rabbit prepared as in the experiment of October 21 the depressor nerves were stimulated while the splanchnic nerves were still uncut.

Blood-pressure before stimulation of depressor nerves.	Lowered by stimulation to	Fall per cent.	Remarks.
57 mm.	35 mm.	39	The artificial circulation was interrupted, and the stimulation repeated.
68	48	29	
75	38	49	
57	35	39	Artificial respiration was stopped during stimulation. This record is reproduced in Fig. 4.
68	48	29	
75	38	49	

Both splanchnic nerves were now torn through by means of the threads which had been placed around them. The blood-pressure thereupon fell to 52 mm. By the injection of warm 0.8 per cent sodium chloride solution into the right jugular vein the blood-pressure was raised again. The stimulation of the depressor was repeated, the artificial respiration being stopped during each stimulation period.

Blood-pressure before stimulation of depressor nerves.	Blood-pressure lowered to	Fall per cent.	Remarks.
80 mm.	50 mm.	38	
65	40	38	
87	55	37	More salt solution injected.
70	50	29	With artificial respiration.
70	50	29	Without artificial respiration. (Note that suspending the artificial respiration during the period of observation does not impair the method.)
76	50	34	
80	48	40	This record is reproduced in Fig. 5.
84	53	37	

Figure 4 is a photographic reproduction of the alteration in the blood-pressure curve produced by the simultaneous stimulation of both depressor nerves while the splanchnic nerves were still connected with the vasomotor centre.

In this figure the uppermost line is the curve of blood-pressure in the carotid artery. It was drawn by a membrane manometer the

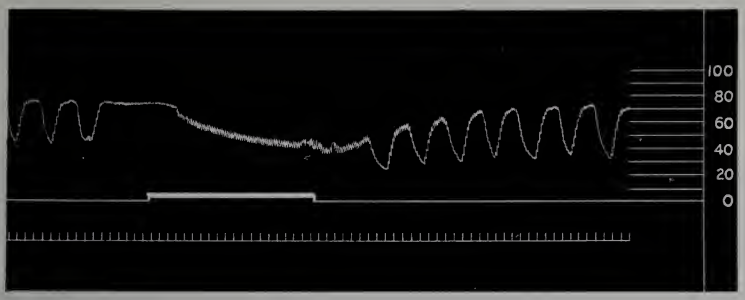

FIGURE 4. — October 26, 1899. Original size. The uppermost line was drawn by a membrane manometer connected with the carotid artery. The graduation scale of this manometer is reproduced on the right. The middle line marks atmospheric pressure; it was drawn by the writing point of an electro-magnetic signal which also recorded, by a white band, the simultaneous stimulation of both depressor nerves. The lowest line marks the time in seconds. The artificial respiration was suspended during the observation. The splanchnic nerves had been prepared for experimentation, but were not yet separated from the vasomotor centre. On stimulating the depressors the blood-pressure fell from 75 mm. to 38 mm. (49 per cent).

graduation scale of which appears on the right of the figure. The middle line marks the atmospheric pressure; the broad white line records the simultaneous stimulation of both depressor nerves. The lowest line gives the time in seconds. The artificial respiration was suspended for a brief period during the observation. Comparative observations, one of which is recorded in the protocol of October 26, show that this procedure does not impair the usefulness of the method. On stimulating the depressor nerves the blood-pressure fell from 75 mm. to 38 mm. (49 per cent). This result is to be compared with that shown by Fig. 5.

In this figure, as in Fig. 4, the uppermost line is the curve of blood-pressure in the carotid artery, the middle line records the atmospheric pressure and the stimulation of the depressor nerves, and the lowest line records the time in seconds. Both splanchnic nerves had been severed. The blood-pressure was raised after the section of the splanchnic nerves by the injection of 0.8 per cent

sodium chloride solution into the jugular vein. On stimulating the depressor nerves the blood-pressure fell from 80 mm. to 48 mm. (40 per cent). Thus the fall secured after the separation of the splanchnic nerves from the vasomotor centre was almost as great as that obtained before these nerves were severed.

It appears, therefore, from these numerous experiments that the stimulation of the depressor nerve can lower the blood-pressure as much, or exceptionally almost as much, when the abdominal vessels are separated from the vasomotor centre by the section of the splanchnic nerves as when this connection is intact, provided only

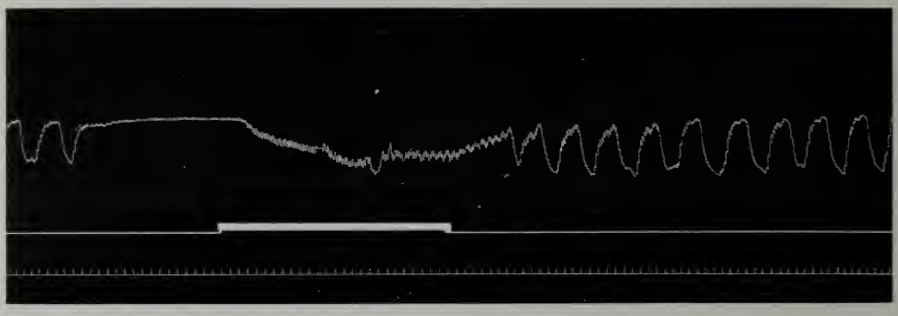

FIGURE 5. — October 26, 1899. Original size. As in Fig. 4, the uppermost line records the carotid blood-pressure, the middle line the atmospheric pressure and the stimulation of the depressor nerves, the lowest line the time in seconds. Both splanchnic nerves had been severed. The blood-pressure was raised by the injection of warm normal salt solution into the jugular vein. On stimulating the depressor nerves, the blood-pressure fell from 80 mm. to 48 mm. (40 per cent).

that the general blood-pressure after section of the splanchnic nerves be raised high enough to enable the depressor nerves to act with power. The few exceptional cases (for example, Fig. 5), in which the depressor stimulation failed to lower the blood-pressure to quite the same degree after the section of the splanchnic nerves as before section, may reasonably be explained by the unavoidable shock of the operation, and the relatively crude method of restoring the level of the blood-pressure.

CONCLUSION.

There is no sufficient evidence that the depressor nerve forms a special connection with the cells which control the vasomotor fibres of the splanchnic nerves. It is probable that the depressor nerves

connect in the same way with all the cells in the bulbar vasomotor centre, and there is no reason to suppose that other afferent vasomotor nerves differ in this respect from the depressor nerve. Afferent vasomotor fibres would thus influence all the bulbar vasomotor cells alike, and the bulbar centre would have no part in the distribution of the blood to the several organs and regions of the body. The bulbar centre would act merely to raise or lower the general blood-pressure.

TABLE I.

Showing the fall in blood-pressure produced by the simultaneous stimulation of both depressor nerves in rabbits in which the splanchnic nerves were prepared but were not severed.

Date (1899).	BLOOD-PRESSURE IN MM. HG. Before stimulation of both depressors.	Lowered by stimulation to	Fall (per cent).	Remarks.
Oct. 3	64 mm.	50 mm.	23	Thread around each splanchnic; mercury manometer.
" 4	60	40	33	Thread around left splanchnic; right nerve not prepared; mercury manometer.
	70	47	33	
	54	38	30	
" 6	110	64	42	Thread around each splanchnic; artificial respiration; mercury manometer.
	107	67	37	
	110	70	36	
" 14	60	41	32	Thread around each splanchnic; artificial respiration; mercury manometer.
	66	41	38	
	120	55	54	
" 21	80	60	25	Thread around both splanchnics; Hürthle manometer.
	75	60	20	
" 26	57	35	39	Thread around both splanchnics; artificial respiration.
	68	48	29	
	75	38	49	The rise to 75 mm. was due to stopping the artificial respiration.

TABLE II.

The effect on blood-pressure of depressor stimulation before and after the separation of the splanchnic area from the vasomotor centre. The pressure after section of the splanchnic nerves was raised by the stimulation of their peripheral ends.

BLOOD-PRESSURE IN MM. OF MERCURY.

Date (1899).	After section of both splanchnic nerves.	On stimulation of the peripheral segments of the splanchnic nerves.	On depressor stimulation.	Fall per cent on depressor stimulation.
March 20	55 mm.	85 mm.	60 mm.	30
	60	105	80	24
" 22	70	78	55	30
" 24	25	35	25	30
April 1	65	100	75	25
" 6	50	70	40	43
	45	70	48	31
	48	65	38	41
" 7	45	58	35	40
	45	52	33	37
" 8	38	60	48	20
	44	65	52	20
	52	70	50	29
	42	58	44	24

TABLE III.

The effect on blood-pressure of depressor stimulation before and after the separation of the splanchnic area from the vasomotor centre. The pressure after section of the splanchnic nerves was raised by the injection of warm 0.8 per cent sodium chloride solution into the jugular vein.

BLOOD-PRESSURE IN MM. OF MERCURY.

Date (1899).	After section of both splanchnic nerves.	On stimulation of the peripheral segments of the splanchnic nerves.	On depressor stimulation.	Fall per cent on depressor stimulation.
Oct. 7	50 mm.	90 mm.	53 mm.	41
" 17	50	110	75	32
		125	85	32
" 21	60	85	65	24
		85	58	32
		88	60	32
		85	58	32
		86	60	30
		85	60	29
		90	60	33
		88	55	37
		90	57	37
		90	60	33
" 23	52	60	45	25
" 26	52	80	50	38
		65	40	38
		87	55	37
		70	50	29
		70	50	29
		76	50	34
		80	48	40
		84	53	37